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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/666,149	09/19/2003	James M. Nelson	BO1-0021US	8217

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EXAMINER	
BROOME, SAID A	
ART UNIT	PAPER NUMBER
2628	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/12/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/666,149	NELSON, JAMES M.	
	Examiner	Art Unit	
	Said Broome	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 December 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-41* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This office action is in response to an amendment filed 12/28/2006.

2. Claims 1, 9, 15 and 23 have been amended by the applicant.

4. Claims 2-8, 10-14, 16-22 and 24-41 are original.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 6, 7-10, 13-17, 20-24, 27-31, 34-48 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schilling et al.(herein "Shilling", "*Multiple-return laser radar for three-dimensional imaging through obscurations*") and Bala et al. et al.(herein "Bala et al.", US Patent 5,522,019).

Regarding claims 1, 15 and 29, Schilling illustrates facilitating detection of an object a in Figure 11. Schilling teaches collecting a point cloud of three dimensional imaging data representing an area of study where an object potentially is obscured by intervening obstacles on page 2791 column 2 lines 14-17 ("*...3-D imaging in the presence of obscurations...*") and on page 2793 section 3 lines 9-11 ("*The laser radar return signals are digitized and stored, resulting in a 3-D array of data representing the entire volume of interest.*"). Schilling also teaches processing imaging data to identify elements in a point cloud, or three-dimensional set of

points, having substantially common attributes signifying that the identified elements correspond to a feature in the area of study that is at least partially obscured by the intervening obstacle on page 2796 section D lines 1-10 ("*...our whole-return detection scheme is an enhanced capability to accomplish 3-D imaging through partial obscurations...*"), where it is described that points that lie within a common range that belong to the object is obtained as illustrated in Figure 11. Shilling teaches generating a reversed orientation visualization model from the imaging data for a region of interest, thereby exposing the feature on page 2796 section D lines 1-10 ("*...our whole-return detection scheme is an enhanced capability to accomplish 3-D imaging through partial obscurations...*") and on page 2797 left column lines 1-2 ("*...we are able to detect approximately 32% of the target information through a double camouflage net.*"), where it is described that a reversed representation of the model that presents areas partially obscured through subtraction of other background objects or obstacles is generated thereby displaying the reversed orientation model and exposing the feature, as shown in Figures 11 and 12. Regarding the preamble of claim 15, Schilling teaches a computer that contains a computer-readable medium that has instructions for detecting an object hat is obscured by obstacles on page 2791 in the abstract lines 5-6 and on page 2798 section 8 second column lines 10-14. Regarding the preamble of claim 29, Shilling teaches a system for facilitating detection of an object on page 2691 right column lines 12-15 ("*We briefly describe the basic principle of operation and system architecture of the laser radar system. Field trial results demonstrate the system capabilities...*"). However, Schilling fails to teach generating at least one isosurface associating elements having substantially common attributes. Bala et al. teaches generating an isosurface associating elements that have common attributes in column 1 lines 13-23 and 41-43 where it is

described that a set of points that have constant scalar field values are used to generate an isosurface and contain connectivity information signifying that they correspond to the generated surface as described in column 6 lines 64-66. It would have been obvious to one of ordinary skill in the art to combine the teachings of Schilling et al. with Bala et al. et al. because this combination would provide fast and efficient detection of an object through obscurities by gathering three-dimensional data in order to generate an isosurface of points with common attributes, thereby reducing the computation time that would be spent on generating an actual surface of the object.

Regarding claims 2, 16, and 30, Schilling teaches gathering the point cloud of three dimensional imaging data of the area of study on page 2793 section 3 lines 9-11 ("*The laser radar return signals are digitized and stored, resulting in a 3-D array of data representing the entire volume of interest.*"). Though Shilling does not explicitly teach gathering data from an aerial position it would have been obvious to one of ordinary skill in the art that detection of the object would be possible from an aerial position as well, due to laser detection performed through an atmosphere regardless of its elevation, as described on page 2791 section 2 lines 6-9 ("*...laser radiation travels through the atmosphere, is scattered by whatever it hits, and a small portion of the laser radiation is reflected directly back to the transceiver.*"). Therefore it would be possible to acquire the data at varying elevations because the elevation does not affect the detection capabilities of the laser.

Regarding claims 3, 10, 17, 24, 31, and 38, Schilling teaches three-dimensional imaging data of the scene is gathered using ladar, or laser radar system, on page 2792 second column second paragraph lines 7-13.

Regarding claims 6, 13, 20, 27, and 34, Schilling et al. teaches on page 2791 column 2 lines 9-17 ("*...the capability to digitize and store the entire return pulse for a software-selectable range gate of interest.*"), where a particular range within the 3D data is selectable, therefore a region of interest may be selected for generating the reversed orientation visualization model which provides the region without obscurities, as shown in Figure 11.

Regarding claims 7, 21, 28 and 35, Though Shilling does not explicitly teach a top-down view of the region of interest, it would have been obvious to one of ordinary skill in the art that detection of the object, such as the a nonreversed orientation which that includes points gathered without removing the obscurities as shown in Figure 14, it would be possible from an aerial top-down position because laser detection performed through an atmosphere regardless of its elevation, as described on page 2791 section 2 lines 6-9, and it would therefore be possible to acquire the data at varying elevations such as from a top-down position because the elevation does not affect the detection capabilities of the laser. Schilling teaches a reversed orientation visualization model on page 2796 section D lines 1-9 and is also illustrated in Figure 11.

Regarding claims 8, 14, 22, 36 and 41, Schilling et al. teaches on page 2796 section D lines 1-9 a reversed orientation visualization model that exposes areas of total occlusion by using a laser system that enables analysis of an area of interest from varying elevations and distances, as shown in Figures 11 and 12.

Regarding claims 9, 23 and 37, Schilling illustrates a method for detecting a possible presence in an area of study of a ground-level object in Figure 11. Schilling teaches gathering a point cloud of three dimensional imaging data representing the area of study on page 2793 section 3 lines 9-11 ("*The laser radar return signals are digitized and stored, resulting in a 3-D*

array of data representing the entire volume of interest.“). Though Shilling does not explicitly teach gathering data from an aerial position it would have been obvious to one of ordinary skill in the art that detection of the object would be possible from an aerial position as well, due to laser detection performed through an atmosphere regardless of its elevation, as described on page 2791 section 2 lines 6-9. Therefore it would be possible to acquire the data at varying elevations because the elevation does not affect the detection capabilities of the laser. Shilling also teaches an intervening obstacle that impedes a line of sight between the aerial position and a ground-level object on page 2796 section D lines 1-9. Therefore the detection of the object would be possible from an aerial position as well, because using laser detection through the atmosphere, as described on page 2791 section 2 lines 6-9, at varying elevation does not affect the detection capabilities of the laser. Schilling also teaches processing imaging data to identify elements in a point cloud, or three-dimensional set of points, having substantially common attributes signifying that the identified elements correspond to a feature in the area of study that is at least partially obscured by the intervening obstacle on page 2796 section D lines 1-10 (“*...our whole-return detection scheme is an enhanced capability to accomplish 3-D imaging through partial obscurations...*“), where it is described that points that lie within a common range that belong to the object are obtained as illustrated in Figure 11. Shilling teaches selecting a region of interest from the area of study on page 2793 section 3 lines 9-11 (“*...a 3-D array of data representing the entire volume of interest.*“), where it is described that a region of interest is generated, therefore the region was selected prior to the rendering. Though Shilling does not explicitly teach generating from an aerial position, it would have been obvious to one of ordinary skill in the art that detection of the object would be possible from an aerial position as well, because the

elevation does not affect the detection capabilities of the laser detection performed through an atmosphere, as described on page 2791 section 2 lines 6-9. Therefore it would be possible to acquire the data at varying elevations. Shilling teaches an up from underground oriented visualization model, or reversed oriented model of the region of interest exposing the feature in the area of study that is at least partially obscured by the intervening obstacle in the line of sight between the aerial position and the ground-level object on page 2796 section D lines 1-10 ("...*our whole-return detection scheme is an enhanced capability to accomplish 3-D imaging through partial obscurations*...") and on page 2797 left column lines 1-2 ("...*we are able to detect approximately 32% of the target information through a double camouflage net.*"), where it is described that a reversed representation of the model that presents areas partially obscured through subtraction of other background objects or obstacles is generated. Shilling illustrates displaying the up from underground visualization model in Figures 11, 12 and 16. Regarding the preamble of claim 23, Schilling teaches a computer that contains a computer-readable medium that has instructions for detecting an object hat is obscured by obstacles on page 2791 in the abstract lines 5-6 and on page 2798 section 8 second column lines 10-14. Regarding the preamble of claim 37, Shilling teaches a system for detecting a possible presence in an area of study of a ground-level object on page 2691 right column lines 12-17 ("*Field trial results demonstrate the system capabilities, with emphasis on 3-D imaging in the presence of obscurations such as foliage and camouflage netting.*"). However, Schilling fails to teach generating at least one isosurface associating elements having substantial common attributes. Bala et al. teaches generating an isosurface associating elements that have common attributes in column 1 lines 13-23 and 41-43 where it is described that a set of points that have constant scalar

field values are used to generate an isosurface and contain connectivity information signifying that they correspond to the generated surface as described in column 6 lines 64-66. It would have been obvious to one of ordinary skill in the art to combine the teachings of Schilling et al. with Bala et al. et al. because this combination would provide fast and efficient detection of an object through obscurities by gathering three-dimensional data in order to generate an isosurface of points with common attributes, thereby reducing the computation time that would be spent on generating an actual surface of the object.

Claims 4, 5, 11, 12, 18, 19, 25, 26, 32, 33, 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schilling et al. in view of Bala et al. et al., in further view of Foley et al. and in further view of Valle et al.

Schilling et al. and Bala et al. et al. teach what is disclosed in claims 4, 5, 11, 12, 18, 19, 25, 26, 32, 33, 39 and 40 except the method of computing a mesh using a fast binning method and the computation of the isosurface of the object using a marching cubes method. Foley et al. teaches generating an isosurface using a marching cubes method on page 1048. The method of generating a mesh using a binning method is known in the art, and is described by Valle et al. on page 1 in lines 1-2 of the synopsis section, and lines 1-5 of the description section. It would have been obvious to one of ordinary skill in the art to combine the teachings of Schilling et al. and Bala et al. et al. with the marching cube method of Foley et al. and the binning method of Valle et al. because both methods improve the generation of the surfaces of the mesh data from an obtained group of data points through the generation of a smooth isosurface that presents a simplified representation of common points acquired from an area of interest.

Response to Arguments

Applicant's arguments filed 12/28/2006 have been fully considered but they are not persuasive.

The applicant argues the 35 U.S.C. 101 rejection of claims 1-14. The applicant's arguments are persuasive and the examiner withdraws the rejection due to the amendment to claims 1 and 9, which now provide a tangible result, and therefore claims 1-14 are statutory. The applicant also argues the 35 U.S.C. 101 rejection of claims 15-28. The applicant's arguments are persuasive and the examiner withdraws the rejection due to the amendment to claims 15 and 23, which now contain a statutory computer-readable medium, therefore claims 15-28 are statutory.

The applicant argues that the reference Shilling used in the 35 U.S.C. 103(a) rejection of claim 1 does not teach generating a reversed visualization model because the reference never mentions the words "reverse", "reversal", etc. However, the examiner maintains the rejection because though Shilling does not specifically use the word "reversal", the reference teaches a similar process of generating a reversed orientation visualization model in which an image is generated showing an occluded object without displaying the materials or substances that are obscuring the object of interest, in the abstract lines 1-3 ("*A compact imaging laser radar was constructed and tested to investigate phenomenological issues in targeting, especially cases involving imaging through obscurations such as foliage and camouflage netting.*") and is also shown in Figures 11, 12 and 16. The applicant also argues that Shilling et al. does not teach the same reverse orientation image generation process as recited in claim 1 by stating that the rang gating used by Shilling is a different process than the applicant. However, Schilling et al. teaches the process as recited in claim 1 of: "...processing the imaging data to identify elements

in the point cloud having substantially common attributes signify that the identified elements correspond to a feature in the area of study…", in section 4D pg. 2797 right column 2nd paragraph lines 6-15 ("*We then combined two of these data sets by first range gating to eliminate the camouflage netting from the data set. Second, the peak detection algorithm is invoked on each gated image. Finally, the images are compared on a pixel-by-pixel basis…Thus the important target pixels from each acquisition are pieced together into a single data set.*"), where it is described that points within the data that have common attributes are processed to generate an image of the area of interest where the area of interest is visualized without the objects occluding the area of interest, as shown in Figure 11 and 12.

The applicant argues that the reference Bala et al. used in the 35 U.S.C. 103(a) rejection of claim 1 does not teach generating a reversed visualization model. However, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Therefore the rejection is maintained because in combination Shilling was relied upon to teach the reverse orientation image generation in section on page 2796 section D lines 1-10 ("*…our whole-return detection scheme is an enhanced capability to accomplish 3-D imaging through partial obscurations…*"), in which an area of interest is shown without the presence of obscurities and obstacles, as shown in Figures 11 and 16. It would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Schilling et al. with Bala et al. et al. because this combination would provide fast and efficient detection of an object through obscurities by gathering three-dimensional data in order to

generate an isosurface of points containing common attributes, thereby reducing the computation time that would be spent on generating an actual surface of every point within the data set representing the object that is free from obscuring objects. The applicant also argues that the reference Bala et al. used in the 35 U.S.C. 103(a) rejection of claim 1 does not provide practical benefit to Shilling. However, it would have been obvious to combine the 3D data acquired by Shilling, with the isosurface generation of Bala, because the isosurface generation of the acquired 3D is performed prior to generation of the reversed visualization to enable the subsequent imaging of the revered visualization, therefore enabling the isosurface generation would provide a more accurate view of the area under obscurity, as described in the applicant's Specification on page 8 lines 11-14, where the isosurface generation enables points within the data comprising common attributes to be collected and then presented in a 2D visualization as shown in Figure 4.

The applicant argues that the references Foley and Valle used in the 35 U.S.C. 103(a) rejection of claims 4, 5, 11, 12, 18, 19, 25, 26, 32, 33, 39 and 40 do not provide a motivation to combine with Shilling and Bala et al. However, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Shilling and Bala et al., Foley and Valle because this combination would provide efficient generation of a collection of 3D data, as taught by Shilling, in which portions of the data which comprise similar attributes are used to generate an isosurface, as taught by Bala et al., through using methods known in the art for representing 3D data containing similar attributes, such as the isosurface marching cubes method known in the art as taught by Foley, and the binning method taught by Valle.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Said Broome whose telephone number is (571)272-2931. The examiner can normally be reached on 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571)272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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2/23/07

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